



# Standard Test Method for Glycol Impurities in Mono-, Di-, Tri- and Tetraethylene Glycol and in Mono- and Dipropylene Glycol (Gas Chromatographic Method)<sup>1</sup>

This standard is issued under the fixed designation E2409; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

## 1. Scope\*

1.1 This test method describes the gas chromatographic determination of glycol impurities in Mono-, Di- Tri- and Tetraethylene Glycol (MEG, DEG, TEG and TeEG) in the range of 5 to 3000 mg/kg, and in Mono- and Dipropylene Glycol (MPG and DPG) in the range 0.01 to 2.5 % (m/m).

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 Review the current Material Safety Data Sheets (MSDS) for detailed information concerning toxicity, first aid procedures, and safety precautions.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

E180 Practice for Determining the Precision of ASTM Methods for Analysis and Testing of Industrial and Specialty Chemicals (Withdrawn 2009)<sup>3</sup>

E300 Practice for Sampling Industrial Chemicals

E1064 Test Method for Water in Organic Liquids by Coulometric Karl Fischer Titration

2.2 *Other Document:*

Manufacturers' instruction manuals of gas chromatograph and digital integration system used.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee E15 on Industrial and Specialty Chemicals and is the direct responsibility of Subcommittee E15.02 on Product Standards.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

## 3. Summary of Test Method

3.1 A portion of the test sample is analyzed by temperature-programmed, capillary gas chromatography over a polyethylene glycol column, using flame ionization detection. For quantification, the External Standard Technique or the Internal Standard (Marker) Technique are applied. When applying the Internal Standard Technique, the standard addition technique is used to eliminate the effect of other impurities present in the glycols. For this purpose, a blank glycol is used, as 100 % pure glycol samples are not available.

## 4. Significance and Use

4.1 Knowledge of the impurities is required to establish whether the product meets the requirements of its specifications.

## 5. Apparatus

5.1 *Gas Chromatograph(s)*, provided with a sample splitter or on-column injection, flame ionization detector and temperature-programming facilities. Optional are pressure programming and auto sampler facilities. The instrument must be suitable for analysis according to the operating instructions given in Table 1 or Table 2.

5.1.1 *Columns*—The analytical column (chemically bonded cross-linked polyethylene glycol) used must completely separate

MEG, DEG, TEG, TeEG, PentaEG (Penta-ethylene Glycol) and 1,4-butanediol, or

MPG, DPG, TPG, and TePG

Figs. A1.1 through A1.5 show examples of chromatograms conforming to the requirements.

5.2 *Digital Integration Equipment.*

5.3 *Analytical Balance*, readability 0.1 mg, calibrated. Recalibrate or verify at regular intervals.

5.4 *Crimp Top Vials*, 1 mL and 5 mL.

5.5 *Crimper/De-capper*, for capping and de-capping the vials.

5.6 *Micro Syringes*, 10 µL.

5.7 *Bottles*, 50 mL, with screw cap.

\*A Summary of Changes section appears at the end of this standard